

Trial Title: Fungicide timing response monitoring in winter barley at Morley.
Centre: Morley

Trial Code: WB22-05502

Variety: Craft

Objective: To record and monitor the yield responses to each of the component spray timings within a fungicide programme on winter barley.

Background: This fungicide response trial was set up in 2008, to work alongside the equivalent fungicide response trial researching winter wheat varieties. It is supported through The Morley Agricultural Foundation (TMAF) as part of the NIAB Morley Long Term Studies (LoTS) programme. The trial uses the winter barley variety Craft, a two-row malting winter barley that displays a strong yield response when comparing untreated to fungicide-treated crops. Craft displays moderately high resistance to mildew, brown rust, rhynchosporium and net blotch; scoring 6, 7, 6 and 6 respectively (according to the 2022-23 AHDB Recommended List). Previous years have shown disease scores in the field to be variable, depending on the pressure.

In 2022, disease levels were low throughout the trial period. There were no significant differences between treatment yields, with a 0.11 t/ha difference observed between the untreated (Treatment 1) and the highest yielding three spray programme containing Revystar XE (Treatment 6). This yield response was in the low range compared to the previous 12 years of trialling data from this site. Interestingly, although not significant, there was a slight drop in yield from the T1 + T2 spray programme. The bulk of the yield uplift was achieved with the T3 adding ca. 0.33 t/ha.

Table 1. Products

Product	Active ingredient and concentration
Proline 275	Prothioconazole 275 g/l
Siltra Xpro	Bixafen 60 g/l and prothioconazole 200 g/l
Revystar XE	Fluxapyroxad 47.5 g/l and mefentrifluconazole 100 g/l

Table 2. Treatments

Treatment	Growth stage timing and date of application				Comment
	GS25	GS31	GS39	GS61	
1	Untreated	-	-	-	Untreated
2	-	Siltra Xpro 0.6 l/ha	-	-	T1 only
3	-	Siltra Xpro 0.6 l/ha	Siltra Xpro 0.4 l/ha	-	T1 + T2
4	Proline 275 0.25 l/ha	Siltra Xpro 0.6 l/ha	Siltra Xpro 0.4 l/ha	-	Spring T0 + T1 + T2
5	-	Siltra Xpro 0.6 l/ha	Siltra Xpro 0.4 l/ha	Proline 275 0.25 l/ha	T1 + T2 + T3
6	-	Revystar XE 0.6 l/ha	Revystar XE 0.4 l/ha	Proline 275 0.25 l/ha	T1 + T2* + T3

Results

As in 2019, 2020 and 2021, disease levels in 2022 were low with net blotch, yellow rust, powdery mildew and Ramularia undetectable at the final assessment on 27th May 2022. Low levels of brown rust were present, particularly within the untreated plots (Table 3).

Table 3. Mean disease scores on untreated plots (n=3 plots per treatment)

Growth Stage	GS 73-77															
Disease	Brown Rust %															
Treatment	Untreated				T1+T2				T1+T2+T3				T1+T2*+T3			
Leaf	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Average disease score	0.3	1.7	15	20	0	0	0	0	0	0	0	0	0	0.01	0.3	1.7

Table 4. Yield (t/ha) of Craft at Morley in 2022, with details of each treatment programme and growth stage timing of application.

Treatment	Growth stage timing and date of application				Comment	Average Yield t/ha
	GS25	GS31	GS39	GS61		
1	Untreated	-	-	-	Untreated	6.78 ± 0.15
2	-	Siltra Xpro 0.6 l/ha	-	-	T1 only	6.89 ± 0.11
3	-	Siltra Xpro 0.6 l/ha	Siltra Xpro 0.4 l/ha	-	T1 + T2	6.56 ± 0.12
4	Proline 275 0.25 l/ha	Siltra Xpro 0.6 l/ha	Siltra Xpro 0.4 l/ha	-	Spring T0 + T1 + T2	6.84 ± 0.15
5	-	Siltra Xpro 0.6 l/ha	Siltra Xpro 0.4 l/ha	Proline 275 0.25 l/ha	T1 + T2 + T3	6.88 ± 0.11
6	-	Revystar XE 0.6 l/ha	Revystar XE 0.4 l/ha	Proline 275 0.25 l/ha	T1 + T2* + T3	6.89 ± 0.11

Figure 1. Yield (t/ha) ± SE for Craft at Morley in 2022.

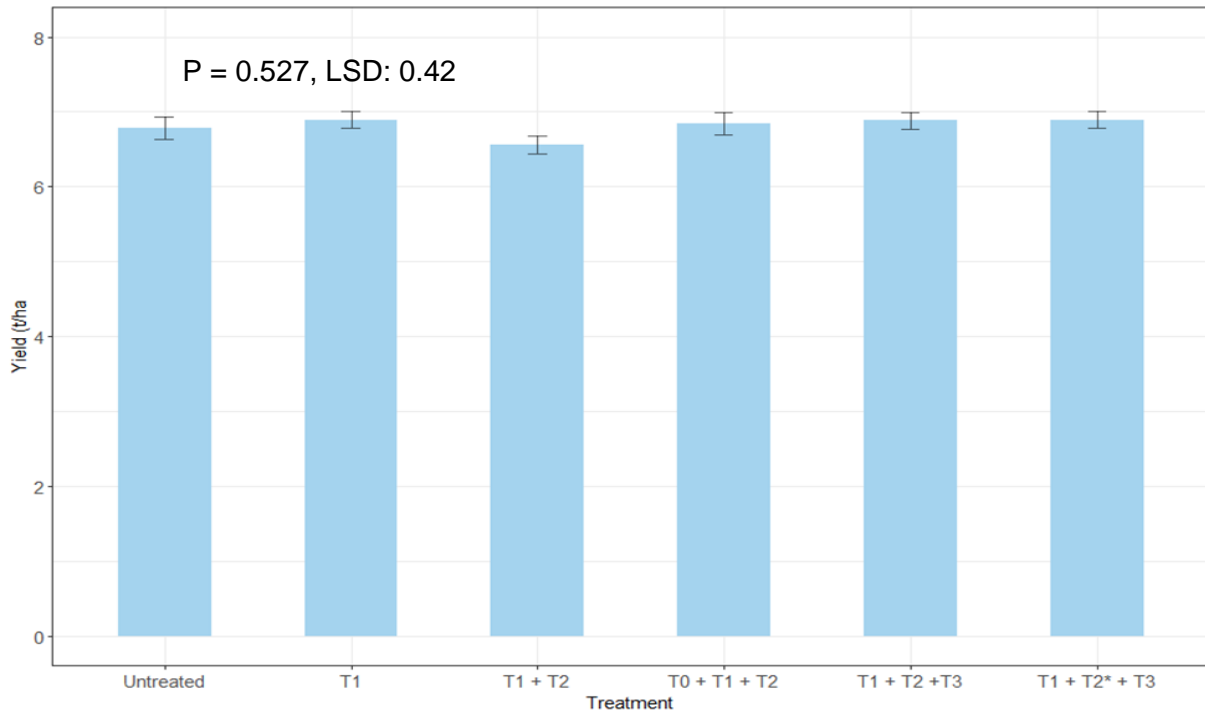


Table 4 and Figure 1 display the yield results for each treatment. There were no significant differences between treatment yields. Untreated plots yielded an average of 6.78 t/ha, and the largest yield increase was observed with a T1 alone, or the full fungicide programme using Revystar XE as a T3, both yielding 6.89 t/ha.

Table 5. Component yield responses (t/ha) for Craft.

Comparison	Yield response (t/ha)
Benefit of T0 alone	0.28
Benefit T1 alone	0.11
Benefit of T2 alone	-0.32
Benefit of T1 + T2 (standard programme)	-0.22
Benefit of T3 alone where Siltra Xpro was used as T2	0.32
Benefit of T3 alone where Revystar XE was used as T2	0.33

Table 5 displays the yield responses to individual components of the fungicide programme. Using a T3 spray induced the most yield response of 0.33 t/ha, whereas a T1 + T2 and the T2 spray programmes resulted in a negative response.

Table 6. Multi-year fungicide yield responses, from 2008 to 2022 at Morley. Previous years' trials have selected winter barley varieties with moderate to high fungicide responses.

Harvest	Timing				
	Autumn T0	Spring T0	T1 + T2	T3	3 spray vs 2 spray programme
2008	0.05	0.10	1.75	No data	
2011	0.00	0.08	0.37	0.00	
2012	0.65	0.73	0.34	0.36	
2013	0.01	0.00	0.51	0.33	
2014	0.12	0.27	1.87	0.53	
2015	0.47	0.49	0.35	0.67	
2016	0.00	0.04	1.24	0.56	
2017	0.00	0.13	1.73	0.36	
2018	0.05	0.08	2.29	0.32	0.31
2019	0.10	0.30	1.48	0.16	0.06
2020	-	0.10	0.20	0.10	0.10
2021	-	0.11	0.38	0.32	0.32
2022	-	0.28	-0.22	0.33	0.31
Mean Response	0.15	0.21	0.95	0.34	0.22

Compared with the mean yield response of the thirteen-year trial period, the 2022 yield response was minimal (Table 6). In 2022, there was an 0.28 t/ha yield response to a spring T0 alone, a -0.22 t/ha response to the addition of a T1 + T2, and a 0.33 t/ha response to a T3.

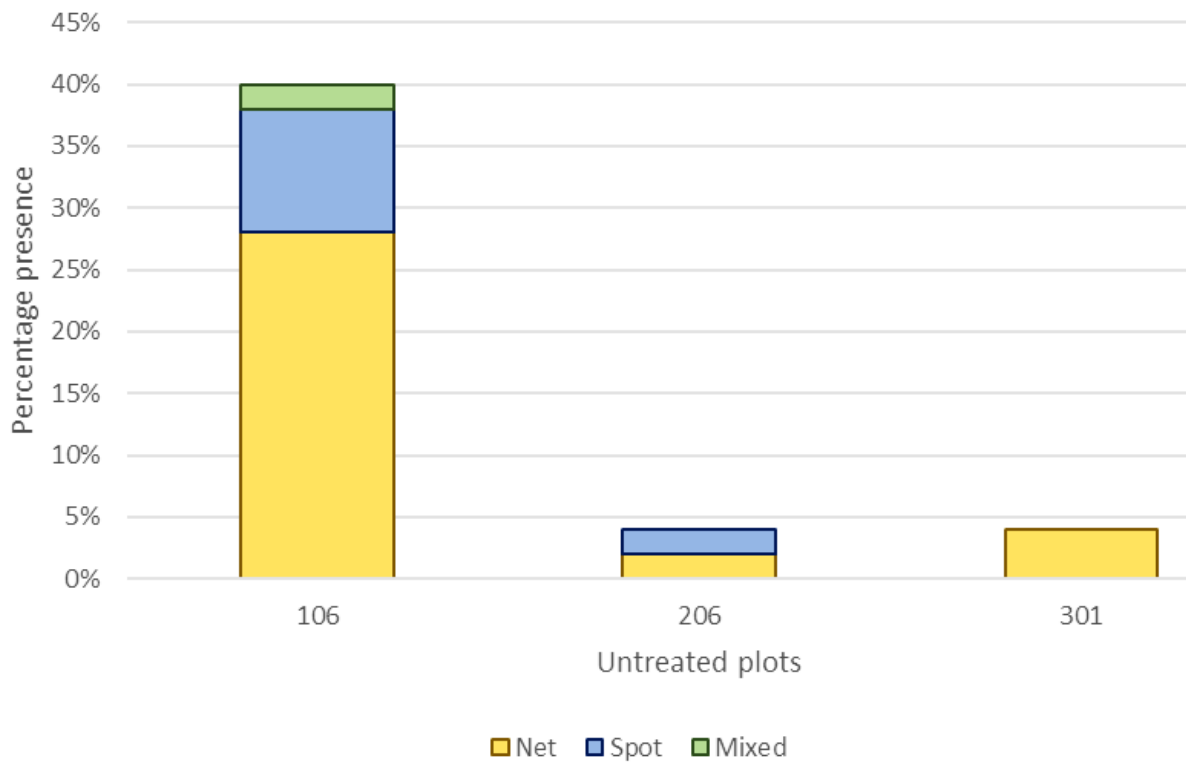
Molecular detection of foliar pathogens

Cultures of net blotch were isolated from 50 leaf samples taken from three untreated plots within the fungicide trial. DNA was extracted from these cultures via CTAB extraction and amplified using polymerase chain reaction (PCR). The products of these reactions were then imaged on an agarose gel, along with controls and compared to the known DNA band sizes of either net form of net blotch or spot form of net blotch. Using this method, it was determined which *forma speciales* of net blotch was present in the trial at different growth stages.

Net Blotch (*Pyrenophora teres f. teres*) and *Pyrenophora teres f. maculate* (spot form)

In 2021, three individual untreated plots within the fungicide trial were compared for the presence for both *forma speciales* of net blotch (Figure 2). Plot 106 showed the highest levels of both *forma speciales* of net blotch, with a total of 40% of the leaves sampled having net blotch isolated and type identified. Both plot 206 and plot 301 had less than 5% presence throughout the plots. Both *forma speciales* of net blotch (*P. teres f. teres* and *f. maculate*), were detected in plots 106 and 206. Plot 301 only showed presence of the net form.

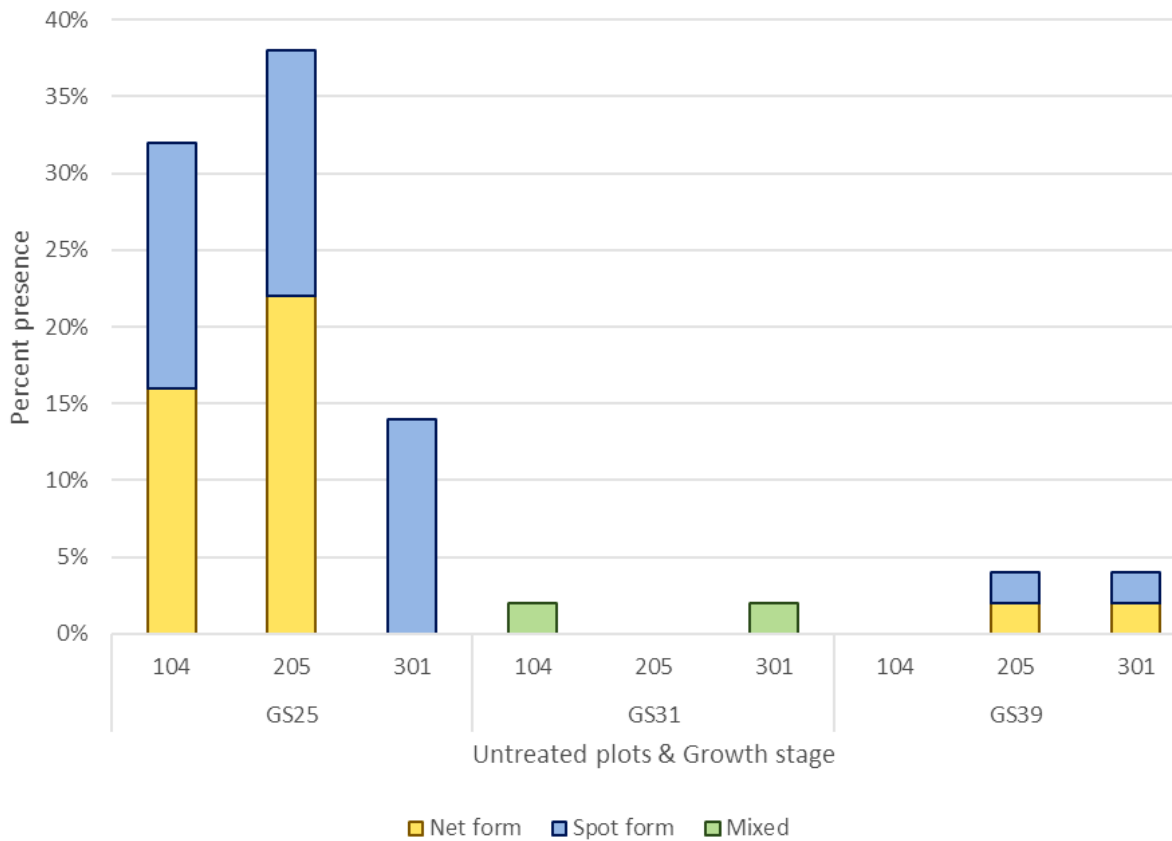
Figure 2. Net blotch presence in untreated plots in 2021.



2022 also compared the untreated plots within the trial, but also included comparison of three growth stages, GS25, 31 and 39. All the untreated plots showed disease presence, however, presence was greatest in the GS25 samples. Notably both plots 104 and 205 showed both *forma speciales* of net blotch, however, 301 only had the spot form present. At GS31 and GS39, plot 301 showed the presence of both. Plot 104 had both forms at GS31 but no presence at GS39 and plot 205 had no presence at GS31 and both forms at GS39. This is not to say the pathogen was not present at these stages within the plots, just not detected in the molecular screen. From these results it can be inferred that both *forma speciales* of net blotch were present within the untreated plots of the trial from GS25 to GS39.

When comparing the two years together, both spot and net form have been present within the untreated plots consecutively. There is a higher prevalence of net form rather than spot form. This is often reflected in visual scores throughout Recommended List trials and could possibly be attributed to the difficulty in visual differentiation of the two forms. As the trial progressed through 2022, lower disease levels were seen as adult plant resistance comes into effect, and although we'd expect to see this from GS59 onwards, it cannot be excluded.

Figure 3. Net blotch presence in untreated plots in 2022.



Ramularia collo-cygni

Ramularia molecular data is currently delayed due to a combination of technical problems and processing time at the laboratory. The report will be amended when data is available.

Field details

Trial Code:	WB22-05502
Trial Centre:	Morley
Trial Location:	Morley
Crop:	Winter Barley
Previous Crop:	Spring Barley
Soil Texture:	Sandy clay loam
Total N/ha Applied:	110 kgN/ha
Drill Date:	01/10/21
Seed Rate:	300 seeds/m ²
Drilled plot size:	2m x 12m
Replicates:	3
Harvest date:	11/07/22